INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/16773

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B01J35/04, B01D53/94, F01N3/24, 3/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] B01J21/00-38/74, B01D53/94, F01N3/24, 3/28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Kokai Jitsuyo Shinan Koho	1971-2004	Jitsuyo Shinan Toroku Koho	1996-2004

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 57-113834 A (Hitachi Zosen Corp.), 15 July, 1982 (15.07.82), Claim 1; page 1, left column, lines 9 to 13; page 2, upper right column, lines 9 to 17, lower rihgt column, lines 2 to 4; Fig. 4 (Family: none)	1-9

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search 29 March, 2004 (29.03.04)	Date of mailing of the international search report 13 April, 2004 (13.04.04)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)

Claims

1. (After amended) A method for producing a honeycomb catalyst having gas conduits for feeding a gas to be treated from an inlet to an outlet of each conduit and performing gas treatment on the sidewalls of the conduit,

characterized in that the honeycomb catalyst has an approximate length such that the flow of the gas to be treated which has been fed into the gas conduits is straightened in the vicinity of the outlet, and that the length (Lb) is specified by Lb = a·Lt (wherein "a" is a constant, and Lt is a sustained turbulent flow distance, which is the distance from the inlet to a site where turbulent flow energy is lost in the course of transition from turbulent flow to laminar flow).

2. (After amended) A method for producing a honeycomb catalyst according to claim 1, wherein the length Lb (mm) is represented by equation (A):

$$Lb = a(Ly/Lys \cdot 22e^{0.035(Ly \cdot Uin)}) \quad (A)$$

(wherein Uin (m/s) represents a gas inflow rate, Ly (mm) represents an aperture size, Lys is an aperture size of 6 mm (constant value), and "a" is a constant falling within a range of 3 to 6, when the aperture size (Ly) is 6 mm and the gas inflow rate is 6 m/s).

3. (After amended) A method for producing an NO_x removal catalyst for use in an NO_x removal apparatus, which is a honeycomb catalyst for use in a flue gas NO_x removal

apparatus, the catalyst having gas conduits for feeding an exhaust gas from an inlet to an outlet of each conduit and performing NO_x removal on the sidewalls of the conduit,

characterized in that the NO_x removal catalyst has an approximate length such that the flow of the gas to be treated which has been fed into the gas conduits is straightened in the vicinity of the outlet, and that the length (Lb) is specified by Lb = a·Lt (wherein "a" is a constant, and Lt is a sustained turbulent flow distance, which is the distance from the inlet to a site where turbulent flow energy is lost in the course of transition from turbulent flow to laminar flow).

4. (After amended) A method for producing an NO_x removal catalyst for use in an NO_x removal apparatus according to claim 3, wherein the length Lb (mm) is represented by equation (A):

$$Lb = a(Ly/Lys \cdot 22e^{0.035(Ly \cdot Uin)}) \quad (A)$$

(wherein Uin (m/s) represents a gas inflow rate, Ly (mm) represents an aperture size, Lys is an aperture size of 6 mm (constant value), and "a" is a constant falling within a range of 3 to 6, when the aperture size (Ly) is 6 mm and the gas inflow rate is 6 m/s).

5. (After amended) A method for producing an NO_x removal catalyst for use in an NO_x removal apparatus according to claim 3, wherein the length of the NO_x removal catalyst falls within a range of 300 mm to 450 mm.

6. (After amended) A method for producing a flue gas

NO_x removal apparatus comprising a plurality of NO_x removal catalyst layers provided in the gas flow direction, each catalyst layer being composed of a plurality of honeycomb NO_x removal catalysts juxtaposed in a direction crossing the gas flow direction,

each honeycomb NO_x removal catalyst having gas conduits for feeding an exhaust gas from an inlet to an outlet of each conduit and performing NO_x removal on the sidewalls of the conduit,

characterized in that each of the NO_x removal catalysts forming each NO_x removal catalyst layer has an approximate length such that the flow of the exhaust gas which has been fed into the gas conduits is straightened in the vicinity of the outlet, that the length (Lb) is specified by $Lb = a \cdot Lt$ (wherein "a" is a constant, and Lt is a sustained turbulent flow distance, which is the distance from the inlet to a site where turbulent flow energy is lost in the course of transition from turbulent flow to laminar flow), and that two NO_x removal catalyst layers adjacent to each other are disposed with a space therebetween, the space serving as a common gas conduit where exhaust gas flows discharged through the NO_x removal catalysts are intermingled one another.

7. (After amended) A method for producing a flue gas NO_x removal apparatus according to claim 6, wherein the length Lb (mm) is represented by equation (A):

$$Lb = a(Ly/Lys \cdot 22e^{0.035(Ly \cdot Uin)}) \quad (A)$$

(wherein Uin (m/s) represents a gas inflow rate, Ly (mm)

represents an aperture size, Lys is an aperture size of 6 mm (constant value), and "a" is a constant falling within a range of 3 to 6, when the aperture size (Ly) is 6 mm and the gas inflow rate is 6 m/s).

8. (After amended) A method for producing a flue gas NO_x removal apparatus according to claim 6, wherein the length of the NO_x removal catalyst falls within a range of 300 mm to 450 mm.

9. (After amended) A method for producing a flue gas NO_x removal apparatus according to claim 7 or 8, wherein 3 to 5 stages of the NO_x removal catalyst layers each having a specific length (Lb) are provided.

AMENDMENT

(Under Provisions of Section 11 of
LAW CONCERNING INTERNATIONAL APPLICATION, ETC.
PURSUANT TO THE PATENT COOPERATION TREATY)

To: Examiner at the Patent Office

1. Identification of the International Application:

PCT/JP2003/016773

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4. Items subjected to Amendment:

Specification and Claims

5. Details of Amendment:

(1) Specification, page 1, line 3 (Specification, page 1, lines 3 to 4): "Honeycomb Catalyst, Denitration Catalyst of Denitration Device, and Exhaust Gas Denitration Device" is amended to "Method for Producing Honeycomb Catalyst, Method for Producing Denitration Catalyst of Denitration Device, and Method for Producing Exhaust Gas Denitration Device."

(2) Specification, page 1, line 8 (Specification, page 1, lines 12 to 14): "a high-performance NO_x removal catalyst and

a flue gas NO_x removal apparatus" is amended to "a method for producing a high-performance NO_x removal catalyst and a method for producing a flue gas NO_x removal apparatus."

(3) Specification, page 2, lines 20 and 21 (Specification, page 1, lines 17 to 24): "a honeycomb catalyst which facilitates detection of actually deteriorated NO_x removal catalysts, thereby attaining effective utilization of NO_x removal catalysts. Another object of the invention is to provide an NO_x removal catalyst for use in an NO_x removal apparatus. Still another object of the invention is to provide a flue gas NO_x removal apparatus." is amended to "a method for producing a honeycomb catalyst which facilitates detection of actually deteriorated NO_x removal catalysts, thereby attaining effective utilization of NO_x removal catalysts. Another object of the invention is to provide a method for producing an NO_x removal catalyst for use in an NO_x removal apparatus. Still another object of the invention is to provide a method for producing a flue gas NO_x removal apparatus."

(4) Specification, page 2, lines 24 and 25 (Specification, page 5, lines 3 to 11): "the honeycomb catalyst has an approximate length such that the flow of the gas to be treated which has been fed into the gas conduits is regulated and straightened in the vicinity of the outlet" is amended to the honeycomb catalyst has an approximate length such that the flow of the gas to be treated which has been fed into the gas conduits is straightened in the vicinity of the outlet,

and that the length (Lb) is specified by Lb = a·Lt (wherein "a" is a constant, and Lt is a sustained turbulent flow distance, which is the distance from the inlet to a site where turbulent flow energy is lost in the course of transition from turbulent flow to laminar flow)."

(5) Specification, page 2, lines 24 and 25 and page 3, line 3 (Specification, page 4, lines 26 and 27 and page 5, lines 20 and 21): "a honeycomb catalyst" is amended to "a method for producing a honeycomb catalyst."

(6) Specification, page 3, lines 13 and 14 (Specification, page 6, lines 12 to 20): "the NO_x removal catalyst has an approximate length such that the flow of the exhaust gas which has been fed into the gas conduits is straightened in the vicinity of the outlet" is amended to "the NO_x removal catalyst has an approximate length such that the flow of the exhaust gas which has been fed into the gas conduits is straightened in the vicinity of the outlet, and that the length (Lb) is specified by Lb = a·Lt (wherein "a" is a constant, and Lt is a sustained turbulent flow distance, which is the distance from the inlet to a site where turbulent flow energy is lost in the course of transition from turbulent flow to laminar flow)."

(7) Specification, page 3, lines 13, 15, and 22 and page 4, line 2 (Specification, page 6, lines 6 and 7, page 7, lines 3, 4, 18, and 19): "an NO_x removal catalyst" is amended to "a method for producing an NO_x removal catalyst."

(8) Specification, page 4, line 8 (Specification, page 7, line 20): "each of the NO_x removal catalysts forming each NO_x

removal catalyst layer has an approximate length such that the flow of the exhaust gas which has been fed into the gas conduits is straightened in the vicinity of the outlet, and two NO_x removal catalyst layers adjacent to each other are disposed with a space therebetween, the space serving as a common gas conduit where exhaust gas flows discharged through the NO_x removal catalysts are intermingled one another" is amended to "each of the NO_x removal catalysts forming each NO_x removal catalyst layer has an approximate length such that the flow of the exhaust gas which has been fed into the gas conduits is straightened in the vicinity of the outlet, that the length (Lb) is specified by $Lb = a \cdot Lt$ (wherein "a" is a constant, and Lt is a sustained turbulent flow distance, which is the distance from the inlet to a site where turbulent flow energy is lost in the course of transition from turbulent flow to laminar flow), and that two NO_x removal catalyst layers adjacent to each other are disposed with a space therebetween, the space serving as a common gas conduit where exhaust gas flows discharged through the NO_x removal catalysts are intermingled one another."

(9) Specification, page 4, lines 8, 12, and 21 and page 5, lines 1 and 5 (Specification, page 7, lines 23 and 24, page 9, lines 5, 6, 19, 20, 26, and 27): "a flue gas NO_x removal apparatus" is amended to "a method for producing a flue gas NO_x removal apparatus."

(10) Specification, page 5, line 4 (Specification, page 9, lines 8 and 9): "which has 3 to 5 stages of the NO_x removal

catalyst layers having a specific length (Lb)" is amended to "wherein 3 to 5 stages of the NO_x removal catalyst layers each having a specific length (Lb) are provided."

(11) Specification, page 6, line 23 (Specification, page 12, lines 21 to 23): "a honeycomb catalyst and an NO_x removal catalyst for use in an NO_x removal apparatus which can be employed at high efficiency, and a flue gas NO_x removal apparatus" is amended to "a method for producing a honeycomb catalyst and a method for producing an NO_x removal catalyst for use in an NO_x removal apparatus which can be employed at high efficiency, and a method for producing a flue gas NO_x removal apparatus."

(12) Claims, page 20, Claims 1 and 2 (Claims, page 29, Claims 1 and 2): "A honeycomb catalyst" is amended to "A method for producing a honeycomb catalyst."

(13) Claims, page 20, Claims 3 to 5 (Claims, pages 29 and 30, Claims 3 to 5): "An NO_x removal catalyst" is amended to "A method for producing an NO_x removal catalyst."

(14) Claims, page 20, Claim 1 (Claims, page 29, Claim 1): "the honeycomb catalyst has an approximate length such that the flow of the gas to be treated which has been fed into the gas conduits is straightened only in the vicinity of the outlet and remains in a turbulent state in other areas on the upstream side" is amended to "the honeycomb catalyst has an approximate length such that the flow of the gas to be treated which has been fed into the gas conduits is straightened in the vicinity of the outlet, and that the length (Lb) is specified by $Lb = a \cdot Lt$ (wherein "a" is a

constant, and Lt is a sustained turbulent flow distance, which is the distance from the inlet to a site where turbulent flow energy is lost in the course of transition from turbulent flow to laminar flow)."

(15) Claims, page 20, Claim 3 (Claims, page 29, Claim 3): "the NO_x removal catalyst has an approximate length such that the flow of the exhaust gas which has been fed into the gas conduits is straightened only in the vicinity of the outlet and remains in a turbulent state in other areas on the upstream side" is amended to "the NO_x removal catalyst has an approximate length such that the flow of the exhaust gas which has been fed into the gas conduits is straightened in the vicinity of the outlet, and that the length (Lb) is specified by Lb = a·Lt (wherein "a" is a constant, and Lt is a sustained turbulent flow distance, which is the distance from the inlet to a site where turbulent flow energy is lost in the course of transition from turbulent flow to laminar flow)."

(16) Claims, page 21, Claims 6 to 9 (Claims, pages 30 and 31, Claims 6 to 9): "A flue gas NO_x removal apparatus" is amended to "A method for producing a flue gas NO_x removal apparatus."

(17) Claims, page 21, Claim 6 (Claims, page 30, Claim 6): "each of the NO_x removal catalysts forming each NO_x removal catalyst layer has an approximate length such that the flow of the exhaust gas which has been fed into the gas conduits is straightened only in the vicinity of the outlet and remains in a turbulent state in other areas on the upstream

side, and that two NO_x removal catalyst layers adjacent to each other are disposed with a space therebetween, the space serving as a common gas conduit where exhaust gas flows discharged through the NO_x removal catalysts are intermingled one another" is amended to "each of the NO_x removal catalysts forming each NO_x removal catalyst layer has an approximate length such that the flow of the exhaust gas which has been fed into the gas conduits is straightened in the vicinity of the outlet, that the length (Lb) is specified by $Lb = a \cdot Lt$ (wherein "a" is a constant, and Lt is a sustained turbulent flow distance, which is the distance from the inlet to a site where turbulent flow energy is lost in the course of transition from turbulent flow to laminar flow), and that two NO_x removal catalyst layers adjacent to each other are disposed with a space therebetween, the space serving as a common gas conduit where exhaust gas flows discharged through the NO_x removal catalysts are intermingled one another."

(18) Claims, page 21, Claim 9 (Claims, page 31, Claim 9): "which has 3 to 5 stages of the NO_x removal catalyst layers having a specific length (Lb)" is amended to "wherein 3 to 5 stages of the NO_x removal catalyst layers each having a specific length (Lb) are provided."

6. List of Appended Document:

Replacement sheets of Specification, pages 1 to 6 and 6/1 (pages 1 to 13, and 13/1)

Replacement sheet of claims, pages 20, 21, and 21/1 (pages 29 to 31, and 31/1)